WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

   a buried grating;

   a waveguide core;

   an absorption section; and

   a tuning section.

Sub C1

2. The device of claim 1, where the device is integrated in a single optical circuit on a common substrate.

3. The device of claim 2, where the device area is less than or equal to 5000 square micrometers.

4. The device of claim 3, where the device length and width dimensions are less than or equal to 500μm along one dimension, and less than or equal to 100μm along the other.

5. A semiconductor photodetector device comprising:

   a substrate of a first doping type;

   an undoped region, laterally disposed above the substrate;

   a grating positioned between the substrate and the undoped region;

   a waveguide laterally disposed above the undoped region;

Sub C2

an upper region, of a second doping type, laterally disposed above the waveguide region, where the waveguide is of a different atomic composition than the substrate, undoped region, and upper region.

6. The device of claim 5, where, above the upper region is laterally disposed an absorption region comprising:

an absorption layer;

an undoped region of a different atomic composition than the absorption layer laterally disposed above the absorption region; and

a metallic diffusion layer laterally disposed above the undoped region;

where the absorption region is centered on, and of a width approximately 20-25% that of, the device of claim 5.

7. The device of claim 5, where the substrate, undoped region, and upper region are made of InP.

8. The device of claim 7, where, above the upper region is laterally disposed an absorption region comprising:

an absorption layer;

an undoped region of a different atomic composition than the absorption layer laterally disposed above the absorption region; and

a metallic diffusion layer laterally disposed above the undoped region;

where the absorption region is centered on, and of a width approximately 20-25% that of, the device of claim 7.

9. The device of claim 5, where the waveguide is composed of InGaAsP.

10. The device of claim 9, where, above the upper region is laterally disposed an absorption region comprising:

an absorption layer;

an undoped region of a different atomic composition than the absorption layer laterally disposed above the absorption region; and

a metallic diffusion layer laterally disposed above the undoped region;

where the absorption region is centered on, and of a width approximately 20-25% that of, the device of claim 9.

11. The device of claim 7, where the waveguide is composed of InGaAsP.

12. The device of claim 11, where, above the upper region is laterally disposed an absorption region comprising:

an absorption layer;

an undoped region of a different atomic composition than the absorption layer laterally disposed above the absorption region; and

a metallic diffusion layer laterally disposed above the undoped region;

where the absorption region is centered on, and of a width approximately 20-25% that of, the device of claim 11.

13. The device of any of claims 6, 8, 10 or 12, where within the absorption region the absorption layer is made of InGaAs, and the undoped layer of InP.

14. A method of monitoring optical signal performance in a communications network utilizing multiplexed optical signals of varying wavelengths to convey information comprising:

demultiplexing a signal;

scanning the demultiplexed signal across the spectrum of possible wavelengths within it;

measuring the ratio of the peak signal strength to the average non-peak strength of that signal.

15. A method of monitoring optical signal performance in a communications network utilizing multiplexed optical signals of varying wavelengths to convey information comprising:

demultiplexing a signal;

scanning the demultiplexed signal across the spectrum of possible wavelengths within it;

measuring the ratio of the peak signal strength to the aggregate non-peak strength of that signal within a defined wavelength region of the peak.

Sub B1

16. A system for measuring the optical power and optical signal to noise ratio of optical signals in a data network, comprising:

a photodetector;

a trans-impedance amplifier;

an analog to digital converter; and

a microprocessor.

17. The system of claim 16, where the photodetector is the device of any of claims 1-12.

18. The system of claim 17, where the photodetector; trans-impedance amplifier, and analog to digital converter are integrated in one circuit on a common substrate.

19. The system of claim 18, where the integrated photodetector; trans-impedance amplifier, and analog to digital converter are integrated on one circuit on a common substrate.

20. A method of monitoring signal strength and information content in a communications system where information is encoded as a multiplexed set of signals, each such signal being a varying function of an independent variable, comprising:

demultiplexing the signal;

measuring the strength of the signal at its peak; and

measuring the ratio of the peak signal strength to the average non-peak strength of that signal.

21. The method of claim 20, where the set of signals comprises a set of optical signals, each such signal having a defined wavelength spectrum.

22. The method of claim 21, where the peak of the signal is its maximum strength within the defined spectrum.

23. A method of monitoring signal strength and information content in a communications system where information is encoded as a multiplexed set of signals, each such signal being a varying function of an independent variable, comprising:

demultiplexing the signal;

measuring the strength of the signal at its peak; and

measuring the ratio of the peak signal strength to the sum of the non peak strengths of that signal within a defined wavelength region centered at the expected peak.

24. The method of claim 23, where the set of signals comprises a set of optical signals, each such signal having a defined wavelength spectrum.

25. The method of claim 24, where the peak of the signal is its maximum strength within the defined spectrum.

26. The method of any of claims 20-25, where the measurement of the peak signal, and the ratio of peak signal to average non-peak, or aggregate non-peak, signal, as the case may be, is done in less than or equal to 500 microseconds.

27. The method of any of claims 20-25, where the measurement of the peak signal, and the ratio of peak signal to average non-peak, or aggregate non-peak, signal, as the case may be, is done in less than or equal to 250 microseconds.

28. The method of claim 27, where the measurements are taken by taking a set of samples of the signal amplitude within the defined wavelength region.

add B27
Add C3
add D5